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2 July 1984

West Europe Report

SCIENCE AND TECHNOLOGY

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WEST EUROPE REPORT

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CONTENTS

NETHERLANDS CHEMICAL FIRM PLANS CARBON FIBER PLANT IN FRG

Joint Venture with Japan

Paris LES ECHOS in French 7 Feb 84 p 8

[Text] The Dutch chemical firm Akzo and its fibers subsidiary, Enka, are preparing to make a decision about building a carbon fiber plant in Europe, in cooperation with the Japanese firm, Toho Rayon/Toho Beslon. Enka has already signed a distribution agreement for carbon fibers produced by the Japanese group.

The proposed European plant is clearly dear to the hearts of the directors of Akzo, who emphasize their competence with composite materials. "We are the world leaders in industrial fibers. We have experience with technical polymers. And we will be the only ones offering a complete line of composites: fiberglass, carbon fibers, aramid fibers," Mr Van der Werf, a member of the Dutch group's board of directors, enthusiastically points out.

Aimed at the U.S. Market

Enka is now in the process of building an aramid fiber plant with a capacity of 5,000 tons per year in the Netherlands. At the end of 1985, this plant will offer some competition to the monopoly which the U.S. firm, Dupont, holds in this field. The investment amounts to 600 million guilders (1.6 billion francs).

"In 10 years, 10 percent of our total sales will come from composite materials," estimates Mr Van der Werf. Akzo's intention is to rely on cooperation--in manufacturing, in processing, and in research--with other European chemical firms, if they are willing. "On this subject, we are the leading evangelists calling for multinational cooperation. So far, we haven't had any great success."

Akzo still derives 30 percent of its sales (14.15 billion guilders, or 39 billion francs in 1982) from fibers, and 16

percent from basic chemistry (salts, chlorine, methanol, etc.). But it has not been content with staying with that market in Europe.

It has also concentrated its forces in heavy chemistry. It established a joint venture with Shell for vinyl chloride monomers (500,000 tons) and polymers (200,000 tons). The agreement is still awaiting approval from Brussels, but that should not create any problem. It also has a joint venture in methanol with DSM and the Norwegians.

Its objective is to strengthen chemical specialty items, pharmaceuticals, and paints, which each account for 10 to 11 percent of total sales. The group expects "spectacular developments in fine chemistry of this type."

For example, in catalysts, where it is a world leader, it has just invested $40 million in the United States in this field. The group is also trying to develop its American connections in paints (last year it bought Wyandotte Paint Products) and in pharmaceuticals.

In the field of health care, its subsidiary Organon is of course interested in biotechnologies. It was the first to introduce a veterinary product based on the properties of DNA. And it is taking part in the DNA program begun by the Dutch government.

Like the other European chemical firms, Akzo in 1983 saw its profits expand. Its net profits during the first 9 months (288 million guilders, or 777 million francs) were up 127 percent.

The Akzo subsidiaries with problems, Zout Chemistry (salts and chlorine) and Enka (fibers) have now gotten out of the red. For the first 9 months, the fibers sector had an operating profit of 90 million guilders (243 million francs). Right now, 1984 appears to be just as good a year.

Decision Finalized

Paris LES ECHOS in French 22 Feb 84 p 8

[Text] As had been expected (LES ECHOS, 7 Feb), Enka, a member of the Dutch group, Akzo, has decided to build on the site of its Oberbruch plant (near Aachen) a new plant which will produce highly resistant carbon fibers. Investments total about 50 million DM.

Production is to begin in the spring of 1986. The plant's capacity may be increased to about 500 tons a year. Production at Oberbruch is based on the manufacturing technology used by Toho Beslon, the Japanese carbon fiber manufacturer with which Enka already has a distribution agreement.

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CSO: 3698/452

AEROSPACE

ESA PRESENTS PLANS FOR EUROPEAN MANNED SPACE STATION

Paris AFP SCIENCES in French 10 May 84 pp 23-29

[Unsigned article]

[Text] Stresa (Italy)--On 3 May, at Stresa, in the presence of Michel Bignier, director of the Space Transport Systems Division of the European Space Agency (ESA), one of his deputies, Robert Mory, presented to the participants of a Eurospace symposium devoted to industrial activities in space, a concept for a space station capable of meeting Europe's needs starting in 1990, which combines the principles of the Eureca automatic station and of the European space laboratory Spacelab.

In so doing, Europe wants to show that it too, can have its own orbital station, at its own scale, with its own technologies, and in a not too distant future, a station habitable for various time periods, composed from modules that already exist or are being built.

Within several weeks of the London meeting of the heads of state of industrialized nations--who should examine Europe's and Japan's eventual participation in the American space station of 1990-1995 and beyond--this idea should wend its way among Europeans, and despite budgetary constraints be well received in Bonn, in Rome, as well as in Paris, by reason of the promising nature of aerospace technologies.

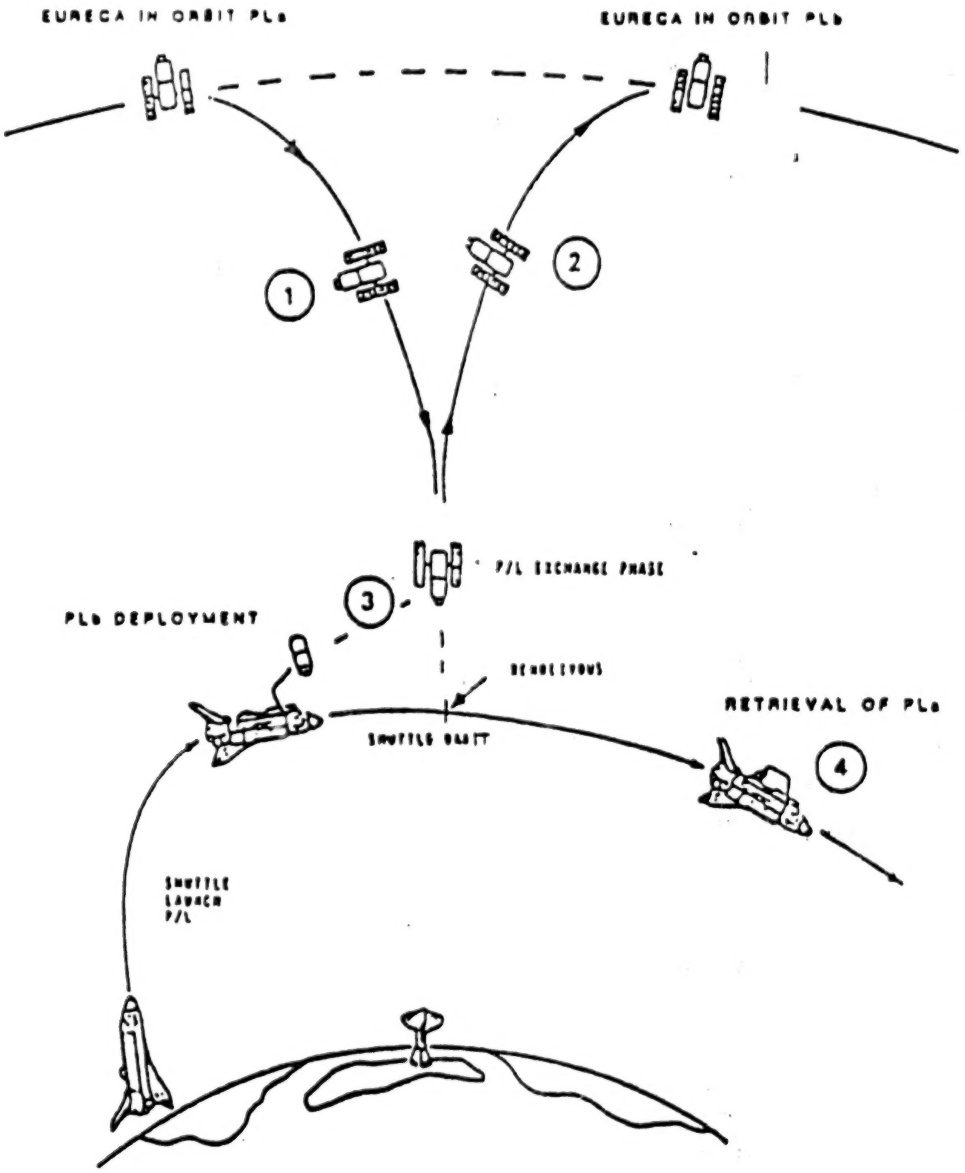
Coming as it does at the time of negotiations between ESA and NASA about the eventual European participation in the permanent American space station, this idea is intended to strengthen Europe's position in space. The latter no longer wants to be considered "as a subcontractor but as a full-fledged partner," in the words of Mr Bignier, ESA director of space transports.

This new ESA program project will be proposed in June for approval by the the governments of the 11 agency member countries, at the same time as the construction of the new HM 60 engine for the European rocket of the next generation, the Ariane 5.

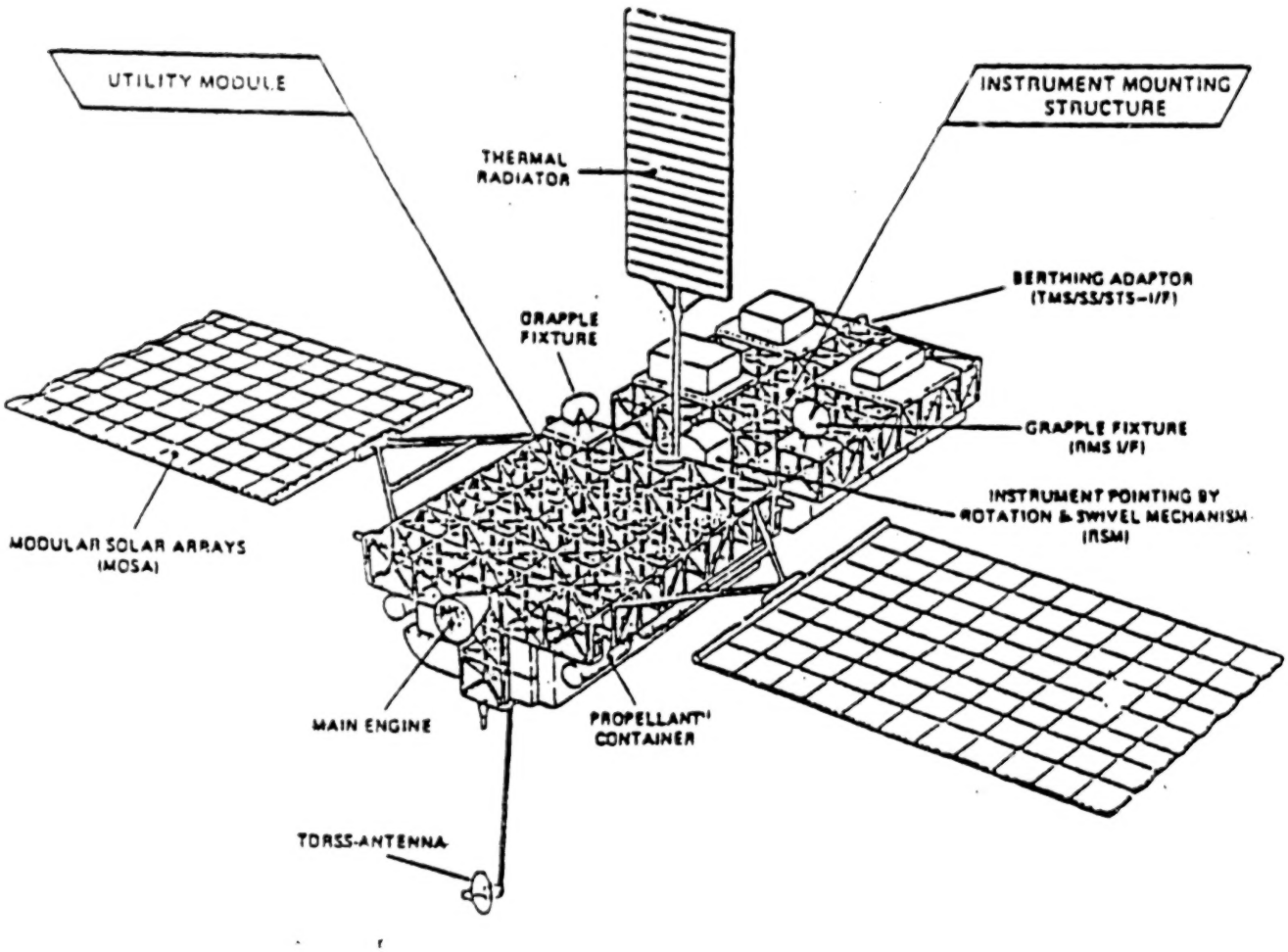
EURECA (SPACE BASED)

SCENARIO FOR FUTURE

MISSIONS AND DEVELOPMENT

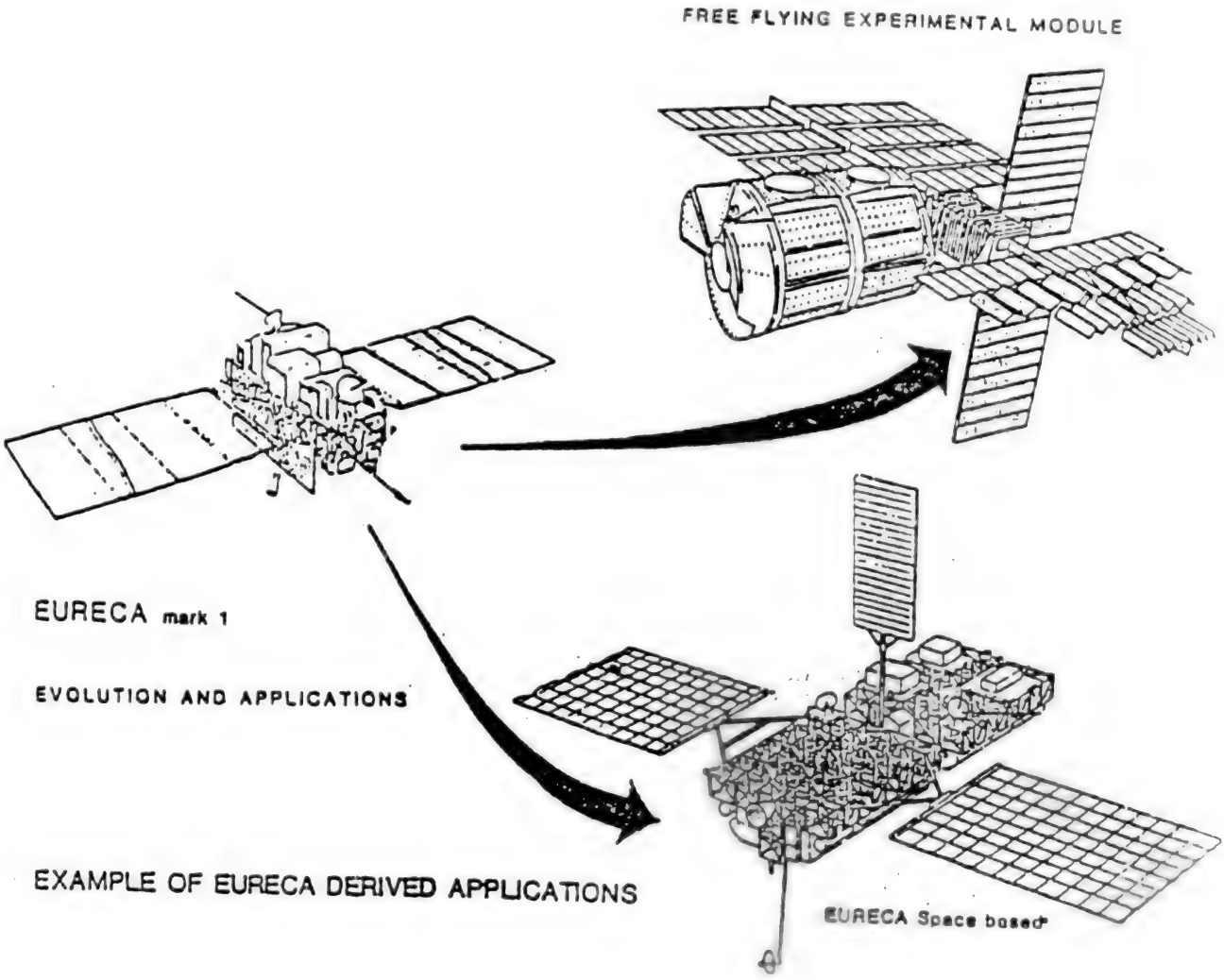


A Eureca platform descends automatically from its work orbit to rendezvous with its new payload, placed in space by the shuttle arm, then resumes its initial orbit while the shuttle returns to earth with a container of products tested or fabricated on the platform.



EURECA Space based

A permanent Eureca platform with its service module in front, containing two solar panels, its main engine and fuel tanks, its antenna for communicating with the satellites of the TDRSS system, and its heat-exchanger radiator. In the rear, is its instrument module, the support for transportation in the shuttle bay, its instrument-pointing mechanism, and its recovery grapple.



One example of Eureca station applications. On the left, a Eureca platform; lower right, a permanent Eureca station; and above, an autonomous Eureca module to which has been added a periodically habitable module of the Spacelab type. The whole constitutes a space mini-station.

The only dark cloud, at least at the start, is that the various modules and temporary crews of this European station will have to be placed in orbit by the American shuttle, until Europe obtains, with the Ariane V rocket, the minishuttle Hermes which can transport up to five astronauts, meaning its two pilots and three occupants of the future station.

The presentation of this concept for a modular European station surprised and strongly interested the scientists and industrialists gathered at Stresa, who since 2 May had discussed the advantages and disadvantages of industrial activity in space. Most of them had perceived only drawbacks: technical difficulties, very high costs, and slow spinoffs.

The idea of a European station is intended to show that at ESA's highest level, and undoubtedly in some governmental circles, there does exist an awareness of the need to define and adopt--as in the United States--long term projects in which science and industry will have to cooperate in exploiting the microgravity available in orbit.

The goal is to create new materials and new products in microgravity, so that Europe will not be outdistanced in this area by the Americans and the Japanese, as has been the case in other sectors of research and industry, and particularly in the computer field.

As designed by ESA specialists, the station is based on the principle of modules attached to each other, one of which can be temporarily inhabited.

This new ESA program project will be proposed in June for approval by the the governments of the 11 agency member countries, at the same time as the construction of the new HM 60 engine for the European rocket of the next generation, the Ariane 5, the most powerful model of Europe's current rocket.

The station is in fact the outcome of the Eureca product line that the agency would like to see built.

The first automatic Eureca platform is to be placed in orbit in October 1987 by the American space shuttle, and recovered in May 1988 during another scheduled flight. It is a sort of satellite of more than 3.5 tons, capable of carrying and operating at an altitude of 600 km for six months, 10 scientific or technical experiments (materials science and life sciences) representing a load of 1200 kg.

Placed in space at an altitude of 300 km by a shuttle, Eureca will climb to 600 km on its own. Six months later, it will redescend by its own means in two and one-half days, to rendezvous at 300 km once more, with a new shuttle which will bring it back to earth. That is what has been approved and financed by ESA so far.

What had been proposed is actually a Eureca Plus program, namely the construction of one or several additional platforms capable of taking the place of the first, and of being connected to each other so as to multiply the experimental possibilities.

According to specialists, each module will be able to provide its own power thanks to its two solar panels, and remove the heat of its instruments through its radiator. The modules will be able to attach to each other automatically by using for their rendezvous the American transmission relay system TDRSS for instance, or a similar system.

In order to bring back the samples of the new materials produced on these platforms, the designers plan to simply drop them to earth with reentry cones copied from the heads of intercontinental balistic missiles, but which will serve a peaceful purpose in this case.

Why not extend the mission of such an automatic space station into the future? Why not go further?

That is when the idea of using Spacelab was mentioned again.

Its first flight in November-December demonstrated all its qualities. Why not build others, place them in orbit with the shuttle, attach them to an American platform, or launch them directly toward the chain of platforms with the Ariane rocket.

Nothing stands in the way. Ariane 5 is a rocket which was designed to have the necessary thrust. This could create an automatic modular station on which two or three men could stay for several days, to change parts, verify the progress of experiments, carry out other ones, and perform maintenance.

So far, no new or almost new part has been designed for this space erector set for the 1990's. The astronauts would be transported by the minishuttle Hermes, which the French National Center for Space Studies has been studying for several years.

Capable of being launched at the tip of an Ariane 5 rocket, and of returning to earth by gliding like the American shuttle, Hermes has the same facilities for rendezvous and handling in orbit, but does not have the large bay of 18 m in length and more than 4 m in diameter. It could however very well transport teams for the European space station both going and coming.

No evaluation of the system's cost was given by Mr Mory at Stresa. The only figure figure quoted, 21 million dollars, represents the cost of a flight ticket on the shuttle, as determined by NASA for a Eureca platform.

The construction cost of other Spacelabs for instance, would undoubtedly be lower than that of the first one given to NASA at the end of the November-December flight.

A complement to the Eureca platform which will fly between October 1987 and May 1988, the concept of a modular space station should make it possible to learn more about microgravity and its consequences, and facilitate the development of new materials (alloys, metals, composite materials), new equipment, and new products, which are all fields with beneficial spinoffs in technology, industry, and employment.

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CSO: 3698/442

BRIEFS

ARIANE-3 LAUNCH DATE--The first firing of an Ariane-3 space launcher is set for 4 August, it was learned from ESA on 9 May. The countdown for this tenth launch of an Ariane has been extended for some days, since the launcher is different from Ariane-1, it was emphasized. The two satellites, TELECOM-1 and ECS-2, will arrive at Kourou only at the beginning of June. The third stage of the launcher will be shipped by air, as for the previous launchings. Ariane-3 uses two powder boosters. They will be fired only 5 to 6 meters above the launch pad to prevent the jets from the motors from damaging two of the four hold-down bolts that hold the launcher during buildup of thrust of these main motors. The third cryogenic stage of Ariane-3, elongated in comparison with that of Ariane-1, is supposed to function for 250 seconds longer than the latter to assure that its payload is put in transfer orbit. [Text] [Paris AFP SCIENCES in French 10 May 84 p 30] 12724

CSO: 3698/443

CIVIL AVIATION

FRG SEEKS CHINESE AIRBUS PARTICIPATION

Duesseldorf HANDELSBLATT in German 8 May 84 p 9

/Text/ The Federal Government wishes a closer collaboration between the Peoples Republic of China and the German economy, according to Minister Lambsdorff in Bonn. He expressed these intentions of Bonn in a conversation with the acting Chinese Vice Premier Li Peng. The minister for economics here especially addressed the following areas:

Nuclear Energy: The German nuclear industry should in the future make a greater contribution to the peaceful use of nuclear energy in China. On Wednesday, a cooperation agreement will be signed in Bonn for the peaceful use of nuclear energy.

Investments: Lambsdorff expressed the expectation that the German Parliament would still in this year ratify the German-Chinese Investment Agreement that was signed in Peking in October 1983. Both countries should try to collaborate more intensively in setting up joint ventures.

Air Traffic: Thought is being given, for example, to Chinese collaboration in the construbtion of the airbus A 320. According to data from the Federal Ministry of Economics, the airbus industry has made specific proposals to the Chinese government, which include technology transfer and the training of professionals, with the objective of building parts for the airbus in Chian beginning in 1986.

8348
CSO: 3698/426

UPDATE ON BUDGET, CONTRACTS OF SPOT REMOTE SENSING SATELLITE

Paris AFP SCIENCES in French 10 May 84 p 31-32

[Text] A year ahead of the planned launch of the first satellite, the European Earth Observation System, SPOT, seems to be on the right track in marketing.

Designed by the National Center for Space Studies (CNES) and made in association with Belgium and Sweden, SPOT will use four successive satellites to provide high-resolution images of the earth's surface for 12 years. These images can be used particularly in studying the nature of the soil, environment, natural resources and in performing cartographic work.

The organizers of "SPOT Days," which were held 3 and 4 May at the Salle Pleyel in Paris, indicated that commercial contracts for exploitation of the images have already been signed between SPOT Images company and eight countries: FRG, Great Britain, Spain, Austria, Italy, Chile, Peru and Venezuela.

Construction of SPOT 1, the first satellite of the program, was decided on at the beginning of 1978, but several delays and difficulties in developing the satellite will probably once more put off its launch by Ariane, scheduled for May 1985. A second satellite, SPOT 2, is supposed to be launched in 1987 to replace its predecessor.

The overall budget is 2 billion francs for SPOT 1 and one billion francs for SPOT 2, this amount including the ground installations and launches by Ariane.

During these days Roger Lesgards, representing Minister of Industry and Research, Laurent Fabius, declared that "the SPOT program should tend toward economic and commercial balance." "SPOT," he stressed, "in this connection is a good example of the commercial space era that is beginning."

Lesgards indicated that SPOT 3, a third satellite now being studied whose construction is to be decided on at the end of the year, should replace SPOT 1 and 2 around 1987. Its life, Lesgards pointed out, will be longer and it will offer broader observation capabilities.

"SPOT 3 will offer a new spectral band in the infrared medium," indicated Gerard Brachet, chief executive officer of SPOT Images, which was created in July 1982 and charged with marketing SPOT products. His company, he said, is now negotiating with several countries that want to have their own receiving stations, whose cost is around 80 million francs. He cited particularly Canada, Brazil, Argentina, Kenya, Upper Volta, South Africa, Saudi Arabia, India, Thailand, China and Australia.

The average cost of a SPOT image of the earth showing a square of about 60 km by 60 km should be about $1,000 in an electronic image and $250 in the form of photographs.

The originality of SPOT in comparison with the equivalent American LANDSAT program is that it offers a greater resolution on theimages: objects from 10 to 20 meters can be seen by SPOT, while LANDSAT makes it possible to observe only objects measuring about a hundred meters.

Further, an adjustable mirror system, installed on the satellite, will increase from 117 to 950 km the zone scanned by the cameras. This "side viewing" will also make it possible to observe the same place on an average of every two days, while the polar orbit allows the satellite to pass vertically over the same point only every 26 days.

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CSO: 3698/443

FRANCE'S BULL, CNET JOIN TO DEVELOP SCIENTIFIC WORK STATIONS

Paris ELECTRONIQUE ACTUALITES in French 11 May 84 p 4

[Unsigned article]

[Text] Bull-Sems, CNET (National Center for Telecommunication Studies), and INRIA (National Institute for Research in Data Processing and Automation) have officially signed an agreement to create a Scientific and Data Processing Public Interest Group aimed at developing a software and hardware environment for the SM 90 (agreement which we have already announced in our issue of 2 December 1983). The chairmanship of the group was entrusted to Georges Grunberg (director general of Bull-Sems), and its direction to Jean-Francois Abramatic, research engineer at INRIA.

Named GIPSI, this group represents an investment of 30 MF, distributed equally between the three partners, its human resources amounting to the equivalent of 30 man/years.

Planned for a duration of four years, GIPSI will develop software for SM 90 scientific work stations, notably for real time applications, with development around Unix (version 7). In terms of hardware, the group will also perfect LISP and Prologue processors among others.

SM 90 production is carried out by Bull (under license) in its Echirolles plant, where the rate is currently about 20 units per month, the long term objective being 100 per month according to Bull.

Nevertheless, this manufacturing level appears to be lower than the one initially mentioned by the company several months ago (several hundred SM 90's per month). In this respect, one might consider that the negotiations which Bull is carrying out with other CNET license holders for the SM 90 (CSEE--Signal and Electrical Enterprises Company, ESD--Electronique Serge Dassault, TRT--Telecommunications, Radioelectricity, Telephone) for a possible production centralization at Echirolles, have not yet borne fruit, as indicated by Bull.

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ROBOTICS FIRMS SEEK PARTNERS TO SHARE R&D COSTS

Munich INDUSTRIEMAGAZIN in German Jan 84 pp 70-72

/Text/ Robot manufacturers are forming partnerships on a worldwide basis. Usually the enormous research and development expenditures provide the stimulus for such cooperation.

"At least by 1990, the robot manufacturers will have their hands full," forecast Dr. Eng. Harald Götze of the Berlin Procam Automation Engineering GmbH in his recent robot report. Only after this - so the expert thinks - will demand be oriented by replacement needs.

There are about 25 productive German firms and, according to the data from the Association of German Machine and Systems Builders (VDMA), they will currently sell about 2,000 robots which cost up to 250,000 marks each; this would be a plus of 25 percent. At the beginning of 1983, barely 4,000 iron men were used in the Federal Republic.

The blossoming market - forecasts promise growths of 50 percent or more annually - has whetted business appetites around the world. With marketing contracts - predominantly from Japanese suppliers - they entered the market and soon thereafter assumed the risk of producing on their own. Today, 220 companies are working in this field in the western industrial nations.

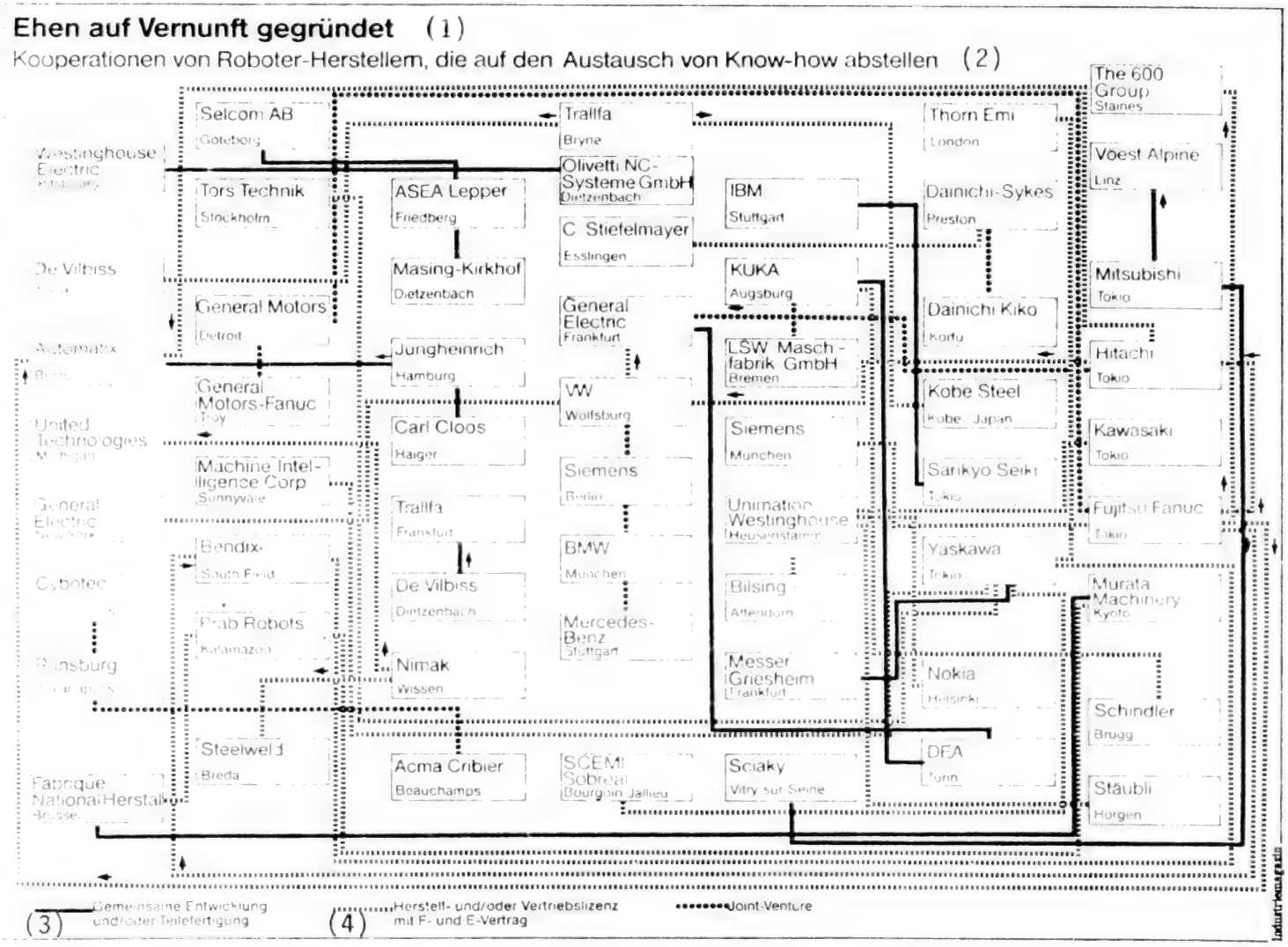
But frugality followed quickly: Development and production of the iron fellows proved expensive in all stages. The run for partners with powerful finances and know-how therefore is proceeding at full speed.

Robot manufacturers are increasingly acquiring additional sales outlets and new know-how through cooperation and are thus also dividing the R&D work.

Besides the high development costs, there is another hefty mainspring for cooperation: The robot manufacturers come from the most various branches, frequently with too one-sided know-how. Robot engineering requires knowledge in mechanics, electronics and process engineering.

Colorful Spectrum of Manufacturers

Some come from machine construction. From Germany, for example, Kuka Welding Systems plus Robots GmbH Augsburg or the Nimak MAG, Wissen. From the USA, the market leader is Cincinnati Milacron, from Sweden the Asea, or from Japan Kawasaki.



Key:
1. Marriages Based on Reason
2. Cooperation of robot manufacturers designed for the exchange of know-how.
3. Joint development and/or parts production
4. Manufacturing and/or marketing license with research and development contract

Electrical and electronic concerns form the second group. In Germany, Siemens and AEG have entered the robot business, Westinghouse in the USA, General Electric in England, Olivetti in Italy, and Fujitsu Fanuc in Japan.

Vehicle manufacturers have also taken up the promising production technology, primarily for their own needs. In Germany, the Volkswagen Plant AG counts as the largest manufacturer before Kuka.

The most various forms of cooperation are practiced between the branches: There are pure marketing relations, where no know-how is exchanged. Thus, the Zeppelin Metal Works GmbH is selling robots from the Japanese Hitachi, or Siemens is selling those from Fujitsu Fanuc.

However, at this time Siemens is subordinating the sales activities for Fanuc to the welfare of its subsidiary Mantec (which makes its own robots in Nuremberg); Kuka has recently dissolved the 10-year marketing contract with Nachi Fujikosai. This indicates that this form of cooperation is unsatisfactory in the long term.

What is looked for now is partners for joint development. The Reis GmbH Obernburg does no research of its own in control technologies, but buys them as a black box from Siemens. There is a similar relation between Dürr Automation and Conveyance Technology GmbH in Murr and AEG.

However, for the most part the partners are doing joint developments with the objective of imparting special capabilities to the robots around the standard mechanics (which makes up only about half of the equipment). Thus the human hand has 22 degrees of freedom, while the best robot claw at this time only has 8.

Threat of Overcapacity

The widest cooperation network to solve development and application problems is currently being woven by BMW, Daimler-Benz, Siemens, and VW as well as the TU-Berling (Berlin Senate) (see chart).

Financially powerful enterprises do not haggle about cooperation contracts. They obtain know-how and distribution routes en bloc from competitors who are in a jam: the Swedish Asea cashed on the robot division of Electrolux AB, Westinghouse purchased Unimation for 210 million marks, and in the meantime Kuka has already acquired Roth Electronics GmbH Gauting, the Expert GmbH Lorch, as well as the Aro from Paris.

It is not clear whether all these cooperations pay off. Over 80 percent of the robot market lie solidly in the hands of about 15 major enterprises, for instance Westinghouse/Unimation, Cincinnati Milacron, Yaskawa Electronic Company, or Kuka: "Many of the more than 200 competitors are not real robot manufacturers; the market is sufficient for 10 manufacturers, if there are more that's where the fun really stops," a sharp boundary drawn by Burkhard Wollschläger from Kuka. His business (1983 sales: about 350 million marks) is figured by the chairman of the board to belong in the upper third of the serious 10.

But the threat of overcapacity is not putting the brakes on the cooperation hunger of the robot manufacturers. The Japanese are increasingly searching for western participation, and the USSR is sending offers to Japan, Germany, and America - thus far without success.

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CSO: 3698/425

CGE OF FRANCE PUSHES COMPUTER-INTEGRATED MANUFACTURING

Paris AFP SCIENCES in French 10 May 84 pp 43-44

[Text] The General Electric Company (CGE) has set itself the goal of becoming No 1 in Europe for computer-integrated manufacturing, the techniques of automating means of production, and of covering "at least 4 percent" of the needs of the world market in 1987, according to an agreement signed with the Ministry of Industry.

The French nationalized industrial group will participate in the implementation of the industrial policy decided on for the 9th Plan (1984-88) by directing its efforts toward automation but also toward the electronics sector, penetration of electric power into industry and cooperation with small- and medium-sized industries.

According to the first addendum to the operating contract between the company and the state signed by Jean-Pierre, chief executive officer of GCE, and Laurent Fabius, French minister of industry and research, CGE will automate production in its plants but also create a group engineering department and expand its activity as a supplier of computer-integrated manufacturing in four areas: machines, industrial control, computer-aided design and manufacturing CAD/CAM and components of computer-integrated manufacturing.

CGE, which now has about 1.2 to 1.5 percent of the world market of computer-integrated manufacturing, therefore wants to take its place among leading world producers, after General Electric, Mitsubishi, Hitachi, Siemens, and Westinghouse.

In the electronics sector, the state in 1984 will provide "large" but unspecified financial support to Thomson-Telecommunications, a holding company managed by CGE and set up by agreements between the two companies in September 1983. Implementation of the office automation plan by CGE, the press release pointed out "will be pursued, taking into account the new prospects opened up by bringing the activities of Thomson-Telecommunications and CIT-ALCATEL closer together and by the cooperation agreement signed with Olivetti in December 1983."

By developing new products and new industrial activities, CGE will also participate in the policy of expansion of penetration of electric power in industry, a goal accepted by the government in July 1983 to take into account the excess electric power available in the coming years in France as a result of the nuclear power program.

This action will be conducted "in consultation with EDF" [French Electric Power Company], and CGE will make an investment of 2.5 billion francs in 1984, including "nearly nine-tenths in France."

In this addendum to the operating contract, CGE specified that it will make a "sustained" export effort with a goal of an annual growth on the order to 20 percent in 1984-85. The company realized 40 percent of its sales of 63 billion francs from export in 1983.

Moreover, CGE will increase its cooperation with small- and medium-sized industries, relying on the Laboratories de Marcoussis (Paris region) particularly to develop technology transfer over the commercial networks of the group to aid in exports.

In the social field, the nationalized group indicated that its main subsidiaries in consultation with personnel representatives, will work out multiyear training plans this year taking into account the need related to the latest technologies, mobility of industrial structures and development of "social dialog."

12724
CSO: 3698/443

COMPONENT PROBLEMS PLAGUE FRENCH ROBOTICS INDUSTRY

Paris L'USINE NOUVELLE in French 17 May 84 pp 60-66

[Article by Michel Defaux]

[Text] Forced to buy abroad various strategic components, French robot manufacturers are stymied in their development, and penalized economically.

Will we have a competitive French robotics industry tomorrow? The question deserves to be asked, because the national robot manufacturers, just as their colleagues in machine-tools, must often seek abroad the indispensible components which they cannot find at home.

This is a serious technologic dependency, especially since in the long run there does exist a market for component manufacturers. A market which is just being outlined today, but which could very well be a strong one in 1990 with the development of robotics in assembly.

Some companies have decided to enter it, and the first industrialized products will be shown during the Machine-Tool Biennial which just opened. AID is talking about speed reducers, Num is introducing the first low-priced controls for maintenance robots, Ratier-Figeac has developed wide-pitch ball screws specially designed for rapid-motion and light-load robots, Sormel will present for the first time its flexible wrist for assembly work, and so on.

This is a first stage, and these few positive examples fail to hide the seriousness of the problem: the French manufacturers of industrial robots acknowledge that they use 20 to 60, and in some cases even 80 percent foreign components. It is not snobbery or pleasure that drives them beyond our borders for supplies. On the contrary; they all state that for equal specifications, they would and will buy French. "I have no preconceived standards," says Christian Guibert, head of the mechanical studies group at AOIP (Association of Precision Instrument Workers) Kremlin Robotique. "If a component exists in France, I will take it, as long as it meets technical specifications. We cannot stop a customer's production line because a component has failed. We test all our components and afterwards look at prices and delivery."

What about prices? That is of course the major consequence of the dependence on foreign goods. "Today, a robot manufacturer is more of a service company than a manufacturer," points out Pierre Margrain, Afma's chief executive officer. "Our major task is to assemble components." How do you resist the importation of foreign robots, how do you compete in price when you depend so strongly on the outside? "It is very difficult to control our prices," confirms Jacques Pegoud, sales manager at Scemi, of the CGE group. "Sudden changes in the dollar have inevitable repercussions on our equipment. Not to mention the problems raised by communications and transportation from companies located in California or Japan. Moreover, the situation is strategically unhealthy, in that we sometimes depend on a single supplier abroad." A situation well summarized by Francois Danel, AID's chief executive officer: "There currently does not exist a competitive French components industry. Given the drawings for a Japanese robot, and buying the parts in France, their cost will already exceed the sale price of the complete Japanese robot."

Generally, robot manufacturers concur on a three-part distribution of costs: one-third for mechanical construction (reduction gears, transmission, structure), one-third for motorization and ancillary aspects (motors, drives, sensors, encoders), and one-third for data processing.

A Rarity: French Reduction Gears

The greatest problems are obviously raised by mechanical devices, which will not come as a surprise to the authors of the famous White Book on mechanical design. France is still short of mechanical designers. Reduction gears are the heart of the problem in robotics; this is a gap which is felt by all robot manufacturers. "Given the reduction ratio that we need, and the space they take," explains Jean-Pierre Platini, in charge of mechanical studies at Citroen Industrie, "we could use only one French reducer out of six we wanted." In this area, one comes up against the quasi-monopoly of the Harmonic Drive company. One plant has been built in Japan by the former German and Japanese representatives who have bought the rights and now control almost the entire world market for robotics, leading to savings on a significant scale.

What about solutions? They could come from two different directions: from the United States first of all, with the Dojen company, which offers a reducer and would provide a second strategic source. The second product is a flat reducer which AID developed and of which it built 400 units for its new assembly robot. It is now available in two sizes (120 and 80 mm diameters). "We are carrying out specific studies and expecting to place this type of component on the market in about one year. We are soon going to produce it with a hollow shaft, allowing cables to be strung through, thus saving time in assembly. We are discussing it with partners for production and marketing," adds Mr Danel. "But for the time being, we have not found one single French manufacturer with the capability of investing in production and of installing an international sales network."

For ballscrew transmissions, there is no problem. The French manufacturers claim to have found what they need. "The French companies are doing it, and we no longer depend on the outside," says Mr Margrain. Moreover, France is selling them abroad; the Swedish Asea buys its ballscrews from La Technique Integrale in Chambery, and Ratier-Figeac is presently negotiating the sale of ballscrew manufacturing licenses to equip Fanuc robots produced for exportation.

The situation is entirely different for ball bearings, and for guide rails and balls. Everyone is being blamed for the prices, of course, especially for ball bearings (there are about twenty of them in a robot), with the preference going to the Japanese products, which are 30 percent cheaper. There are delays as well. "When we asked for guide rail balls," recalls Mr Guibert, "the manufacturer answered that he had a great deal of work with the Airbus program, and quoted deliveries of six to eight months. We could buy them in 15 days from Germany."

No Crowding in Hydraulics

And how about technology! To develop its seventh axis (movable robot connected to a conveyor), AKR looked for ground cylindrical bars and ball sockets. "Painting uses solvents. And we were being offered French ball sockets with plastic and polyamide cages which would not stand up to these products. We needed ball sockets with bronze cages."

After mechanical devices, the robot manufacturers were facing the problem of motorization: hydraulic or electric? In the struggle between these two techniques, hydraulics is steadily losing ground. Renault Acma, the French leader in hydraulic robots, is entering the field of electric robots, as Unimation and Cincinnati Milacron have done earlier. The advantages of the high power of hydraulics (very low inertia of on-board actuators, thus greater load and unequaled speed) can no longer compete against the simplicity and ease of operation of the "all electric" robot.

Under these conditions, the manufacturers of hydraulic components are not climbing over each other, at least in France, to capture this market. But this weakness is not new. "We had to design our own hydraulic servomotors," recalls Michel Fayolle, head of the products department at Acma, "since we could not find them on the market." Same position at AKR: "No one on the French market can supply us with small actuators of the 62 cubic-cm/4.5 mKg or 13 cubic-cm/0.92 mKg type, that operate at less than 50 bars. For the time being we are using American equipment which we machine to attach ball bearings for radial thrusts. It's a solution which does not really satisfy us, and we are going to research our own actuators."

As another example, for an installation to include a seventh axis, AKR designers have looked for a hydraulic motor that could turn very slowly and precisely. They found it at an American company which has a monopoly position. As a result, in an assembly whose complete cost (distribution block, safety valves, servos) is 25,000 francs, the French share (pressure reducer) represents 300 francs.

In microrobotics there are practically no hydraulic components. Several years ago, researchers at the Ecole Nationale Superieure de Micromecanique in Besancon already developed a range of hydraulic servomotors, the heaviest of which weighs 790 g for a torque of 45 nM. And while this product is technically perfected, its marketing is still to come.

Another innovation that is awaiting its turn at the Besancon Laboratory is an electro-hydraulic motorization module with self-adaptive control. The idea is to supply a simplified robot with three or four degrees of freedom in a kit. Each module has a hydraulic actuator and mechanical elements to guide the moving parts, as well as a microprocessor system for position control. The major feature of this device is its speed and response time. "Here again, we are waiting for marketing," explains Pierre Andre, in charge of the Microsystems and Robotics Laboratory of Besancon. "The success of this device will depend on the market for modular robots, notably for assembly."

Servovalves: Anglo-Saxon Domination

Matters are clearer in controls: the robots' sophistication demands servovalves. For the time being, the Americans are in the lead. "We are using Abex American hardware," indicates Mr Guibert. "I have looked for a second source. I consulted all the servovalve manufacturers; two of them took up the challenge, one of them French. During a first test, none of the equipment was satisfactory. The British company Dowty hung on and sent a team from England; they invested and developed the component which you see installed on our robots. The French did not even compete for it; 'We are French,' they said, 'you are going to choose us'."

Another leader on this market is the American Moog, whose French subsidiary manufactures almost all of its controls in France. But as a sign of the times, this company, the symbol of hydraulic high tech, is also turning toward electricity. "The qualities of hydraulics are well known," acknowledges Joachim Dietz, manager of Moog France. "We have even established that a hydraulic wrist could move five times faster than its electric equivalent. But we have to abide by the users' tastes." That is why the company has just introduced a direct current, brushless motor, with a rare earth natural magnet.

On the heels of the American manufacturer, the company Sopelem, which is also an aeronautics offspring, is entering the industrial servovalve market. "A market which is not huge," admits Mr Dietz, "since with 40 employees and revenues of 26 million francs we are holding nearly 50 percent of the French market. The specific advantages of hydraulics are poorly used. Maybe one day, if the loads get heavier and the speeds higher ..." Hydraulics thus seems to be the top of the line in robotics. IBM, which is not famous for its sympathy toward hydraulics, has selected this technology (with a small piston motor and a rack without backlash, it is true) for its latest RS1 portal assembly robot.

Because of this transition to electricity, our dependence on the outside, which is very high for hydraulic components, will therefore be reduced. In the area of electric motors, the general opinion is that France has excellent electrical engineers and manufactures good products. "It is true," acknowledges Mr Danel, "our French motor manufacturers have made an effort. When we were developing robots for the Colly bending presses about two years ago, we were forced to use American motors. We would now build them with French ones." In fact, in the area of direct current motors, which are the most widely used motors in robotics, CEM, with its flat-rotor Axem line, supplies about 80 percent of the robots manufactured in Europe (Volkswagen, Asea, Renault, Kuka, Scemi).

But today, robot manufacturers are looking for higher performance hardware, more complete lines, industrial references, and prices. As a result we are seeing progress in torque motors (relatively high torques, low speeds), studies of high torque motors (which would eliminate reduction gears), and the use of permanent rare earth magnets (samarium-cobalt) in axis motors to improve performances. "The latter products are more expensive--by 20-50 percent--than conventional motors," confirms Mr Margrain, "but they are costs which pay off. For a robot wrist, you go from a ferrite motor which weighs 5.2 kg, to a samarium-cobalt one at 3 kg. If the robot has a nominal load of 10 kg, you have gained 10-20 percent on the payload."

And then there is the latest generation, the brushless direct current motors. The motor is indeed simplified, and failures due to brushes are eliminated, but the control electronics becomes more sophisticated and thus more expensive.

There are those who call it a fad, and those who respond that it has better starting acceleration, high torque at low speed, and that it operates in limiting atmospheres or environments. "This is a technique currently being developed by many enterprises in France, but only foreign motors of this type have been exposed to industrial experience," points out Mr Platini. "Builders like CEM and Ifranor do have prototypes and will be on the market in two years. For the industrial line being launched at present, we could not take the chance of being first users." Artus is also announcing a complete line of brushless motors for the beginning of 1985. Auxilec feels it will be ready at about the same time. "We are currently perfecting the lines of brushless servomotors, motors, torque motors, and motors that will be presented to the Japanese manufacturer Dainichi-Kiko, which we represent," discloses Philippe Gutmann, director of Auxilec Robotique. "We are hoping that our motors will be installed on the robots this manufacturer sells in Europe."

Still remaining is the price problem: robot manufacturers complain of paying 30-40 percent more for servomotors than their Japanese counterparts. These differences are explained by quantity buying: Fanuc produces about 4000 to 5000 servomotors per month, a figure that some French manufacturers barely reach in one year. Moreover, the French servomotor manufacturers are penalized by the price of elementary components; there are no more manufacturers of commutators in France, and these parts must be bought with foreign currency.

The situation is identical for magnetic materials, rare earths such as samarium-cobalt, which are reaching prohibitive prices in France (a ratio of 2:1 with Japan). Another element to be considered is the typical French individualism. Everyone or almost everyone wants his own motor, and there is no standardization. Fanuc at least, produces a mere 28 different types of motors.

Another reef awaiting robot manufacturers are encoders. Many of them bring them from the United States (Litton incremental encoders), and others, such as Acma, use Heidenhein German equipment. "No French company has been able to offer comparable prices, quality, and service," answers Alain Page-Lecuyer, in charge of the purchasing department at Acma Robotique. "I have told the French manufacturers: 'You have 100 percent of the national market to yourselves!' This year I am buying 50 percent in France, but deliveries for the first lots are already one month late. And despite a German mark at 3.07 francs, the Germans are still cheaper. After reducers, encoders are creating supply problems in France."

And yet, some manufacturers are making an effort. Codechamp has developed special encoders for robotics, which are four times smaller than previous models for the latest robot designed by Sirtes. But this manufacturer, specialized in military equipment, is still too expensive, and is now planning two separate structures (military applications and civilian applications). Souriau has developed an optical fiber incremental angular encoder that can be used in severe environments (electromagnetic interference and temperature) which are not tolerated by conventional equipment.

Why Not Supply Axis Systems to Robot Manufacturers?

Another question which is slowly wending its way in robotics is: why not supply robot or machine-tool manufacturers with axis systems, meaning servomotor, encoder, variable speed drive, and control electronics? This would avoid component integration problems, which are always difficult and become the suppliers' responsibility. "This step is not incompatible with cost reduction," points out Mr Margrain. "With a given annual purchasing volume you could offer reasonable prices."

Control Units: A Most Limited Offering

Will we then reach the price of 10,000 francs for a digitized axis, as proposed by Jean-Francois Lemaitre, from the Ministry of Industry and Research? It is too soon to say; not only that, but both torque and function would have to be specified (articulated or cartesian arm). Num is currently entering this field and is supposed to be negotiating with partners. "All that we can say now," indicates Jean Chauveneau, director general of Num SA, "is that we will be offering something, for machine-tools at first, probably before the end of the year. Robotics will follow." All that would remain then would be to handle the problem of robot control and perception of the environment by robots.

In the area of control units, the supply was super-thin, in the words of one robot manufacturer. Num is presently offering the first Robonum 700 controllers, using the technology of the latest model 760, well known in machine-tools. This is a low end product (meaning point by point positioning), designed for loading and unloading maintenance operations. It is sold at a relatively low price of 40,000 francs. Other robotic products in this family are expected. "Robotics is demanding and will force us to implement new equipment and software."

Scemi, in turn, is working on a spinoff from the Ara (Advanced Automation and Robotics) program, whose license it has acquired; this is a modular control structure which will make it possible to coordinate the elementary movements of a robot so as to perform a task assigned in real time. Unlike currently used techniques, this structure does not require a learning phase. The manipulator robot is controlled by a minicomputer connected to a network of microcomputers, which direct the various elementary motions. "This control system is now at the end of its development," says Jacques Pegout, sales director, "and we expect to present it in the fall. It will have a larger memory than those available at present, it will facilitate the implementation of robots, and will reduce equipment costs."

Discoveries That Are Not Always Industrialized

Another product derived from Ara research will be placed on the market in mid-May 1985, to control a robot's environment recognition sensors. The La Calhene company is presently working on SIGLE (Computer System for Performing Local Control) "It is actually a black box," eplains Albert Jouno, head of the robotics department, "with cards which accept several types of sensors and two interfaces: sensor and robot control." The device will control infrared proximity sensors, stress gauges for force measurements, and ultrasonic or Foucault current sensors. "The software will be French, but for the sensors which we will use depending on application, we have to admit that not much is available in France. For the ultrasonic sensor for instance, we have to trust Polaroid. We have no choice."

Need we mention the artificial skin developed by LAAS (Laboratory for Automation and Systems Analysis) four years ago, which has still not been industrialized into touch sensors? The first utilization of this skin should be in a pedometer, a comment which causes French robot manufacturers to jump.

And how about the optical fiber tactile hand developed by Souriau? The light beam from fibers integrated in each finger is broken by contact with an object. This hand can grasp an object, even a fragile one (only several grams of pressure thanks to its detection sensitivity), no matter what its shape or position. A fine technical achievement, but one which is not yet on the market. Souriau has used this technical advance to develop seam following systems; one for Renault, in which the robot must deposit a film of glue or plastic without spilling over, and another for PSA, to lay a welding bead.

Imaging also plays an important role in sensors, and with Itmi, Solems, and Robotronics (Matra), France is standing its ground, even in terms of prices. Solems is selling turnkey systems, one of which has been selected by IBM to control the insertion of components on electronic cards. With its standard equipment, and by cutting corners on computer hardware (an Intel 8085, available on the market), this manufacturer is competitive: 120,000 to 250,000 francs depending on version, are much lower prices than those of its American competititor.

Visiomat, the imaging system developed by Robotronics, which will be on the market toward mid-1984, uses a hard-wired microprocessor to allow very high computing speeds. "Our approach has been strongly marketing oriented," points out Francois Saunier, in charge of sales. "We have tried to stick to the market at a very competitive price for control applications. Imaging adapted to robots has not yet taken precedence over this type of demand, but for Renault, for instance, we are studying a seam following application for robots with very high speed and precision constraints." From 120,000 francs for a screen resolution of 256 x 256 points, to 180,000 francs for 512 x 512 points, is a price which would place Visiomat below its foreign competitors.

But everything is far from rosy for imaging system manufacturers. "My main concern," discloses Gerard Mezin, president of the Itmi directorate, "is that there is no French CCD camera. There is a very good tube built by Thomson, with an excellent signal-to-noise ratio, but they do not want to build a camera for it. There is also the I2S company, near Bordeaux, which is working on its IS400 camera, but when will it be ready? In France, the manufacturers have components and yet nothing comes of it! I have four or five contracts on hold because of that." So everyone buys from General Electric, Fairchild, Sony, and so on.

Sony has even gone so far as to offer a model whose price is barely higher than its basic component. "Sony can afford to flood the market with a product on which it makes no profit," explains Philippe Compagnon, technical sales engineer at I2S. "We are too small and too new to do the same. Our strength would be to provide some extras." And that will be a digital first, a miniature model that can be mounted on a robot's arm, and with glare control (essential for welding). But they will have to move fast.

Wrists and Grips: Manufacturers are Taking Positions

At this time, we are promised that the miniature IS60 camera will be offered next June at 90,000 to 120,000 francs. But should its industrialization be delayed at all, the supertube sold by Thomson could very well be bought by an American manufacturer, and come back to us in the form of complete cameras.

The last pieces of the puzzle for robot manufacturers are wrists and grips, with all their ancillary connections. In this area, which has been essentially American, the French are making some inroads. Sormel has offered at the Machine-Tool Biennial a flexible wrist studied in collaboration with the Besancon Laboratory. This flexible device can be used for automatic

insertion of cylindrical parts (diesel engine injectors, for instance) that have an axis to bore play of several tens of microns. "We think we will sell about ten before the end of the year," states Jean Berger, director of research and development. "We are in contact with Peugeot, Renault, and Roto Diesel, and we are seeking agreements with French and foreign robot manufacturers. This is a first component. There will be others before the end of the year in the area of supply peripherals."

Other companies have defined drilling and routing tool heads developed at the Technical Center for Industrial Robotics of the Avions Marcel Dassault group. These heads, flexible so as to correct robot positioning errors, with broken drill detectors, are interchangeable. Their licenses have been sold to a tool maker in the Paris region, the Recoules company, which is marketing them.

Is it however possible to speak of a components market for the robotics industry? It is true that today, some figures seem weak, and others downright ridiculous. About 300 to 400 industrial robots are installed in France, of which more than 50 percent are foreign. Ratier-Figeac for instance, acknowledged that its own French robotics market for 1984 was about 300 ballscrews. Other sectors, such as imaging sensors, appear more flourishing: Itmi officials estimate the market at 50 CCD cameras per month.

Only Those Who Invest Now Will Succeed

What about tomorrow? The most optimistic statistics estimate 15,000 robots in France in 1990, and others, such as Frost and Sullivan, announce a more reasonable figure of 6400 robots at the same date. Nevertheless, with an average of five axes per robot, the French market for actuators, speed controls, and sensors does not appear negligible. Especially since, as in the case of Num, most of the manufacturers agree that they should aim at the European market: 27,800 robots will be used in two years, 46,000 in 1990. Only those who invest today, while the market is still small, will succeed, those who patiently are building up a line, installing a network, building up references. In 1990 it will be too late.

Beyond this market problem, all the competitiveness of the French robotics industry comes into play. Already penalized by the electronic components that they must buy abroad, our manufacturers must now struggle to maintain the cost of their equipment at reasonable levels. One can wonder what magic AID uses to offer is small six-axis robot at 150,000 francs, or how AKR succeded in seducing the Japanese at the American Honda plant.

However, we have to remain careful. The Japanese robot manufacturers have not yet started to attack Europe. Will we be able to compete against their prices? One of the conclusions of the latest Frost and Sullivan report on robotics in Europe, can be used as a warning: "If the European companies do not protect themselves sufficiently well during the 1980's to retain the largest proportion of the production, American and Japanese importations could represent up to 40 percent of the market in 1990."

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BRIEFS

NEW FRENCH ROBOTICS COMPANY--Renault-Automation and Merlin-Gerin will set up a new joint company on 1 June to produce and market programmable robots, the two companies announced on 3 May. The creation of Renault-Automation/ Merlin-Gerin et Cie is the result of discussions begun in December 1983 by the two companies to bring their activities in the field of programmable robots closer together. The two partners pointed out in a press release that their joint subsidiary will receive assets of 40 million francs, 55 percent held by Renault-Automation and 45 percent by Merlin-Gerin. Under the management of Michel Bartenieff, its aim will be to realize sales of 400 million francs, with a staff of 400 persons employed in three plants in Paris, Castres and Grenoble. Under the trade name "April," the press release added, the new company, with the cooperation of Merlin-Gerin, will market the latter's PB line of robots and the SMC robots of Renault-Automation. The two partners believe that this association should enable the new company to hold one of the first places in the world in its field and to develop new generations of a programmable robots. [Text] [Paris AFP SCIENCES in French 10 May 84 p 44] 12724

CSO: 3698/443

BRIEFS

ITALY BOOSTS AUTOMATION--The demands for devices of production automation will rise in Italy from 426 billion lira in 1982 to 670 billion lira by 1985 (at fixed prices). This appears from a marketing study concerning the development chances of this market, as is reported by the Federal Agency for Foreign Trade Information,Cologne. As the study shows, the demand for flexible production systems will rise from the present 18 billion lira to 70 billion lira by 1985. The robot market will expand from 30 to 80 billion lira. The volume for the processing module will increase from 15 to 50 billion lira. Machine tools with numerical controls should have sales of 375 billion lira in 1985 according to the marketing study (1982: 285). Robots will have a sales increase of 27 to 55 billion lira, and for CAD/CAM the value will rise from 15 to 50 billion lira. /Text//Wuerzburg ELEKTROTECHNIK in German 5 Mar 84 p 10/ 8348

FRG METALLIC 'SUPERGRID' RESEARCH--The Volkswagenwerk Foundation has just made available 1.6 million DM, which the Physical Institute of Clausthal Technical University will receive for the project "Electronic Structure and Properties of Metallic Superstructures." By metallic "Supergrid" one understands periodic sequences of ultra-thin layers of two or more metals, whose "thickness" can be reduced to the diameter of a single atom. The extremely small dimensions of these grids have a more or less strong effect on the mechanical, magnetic, and electrical properties of these new artifical crystals. /Text/ /Duesseldorf VDI NACHRICHTEN in Germany 27 Apr 84 p 1/ 8348

CSO: 3698/425

SIEMENS OFFICIAL ON FIRM'S ROLE IN WORLD ELECTRONICS MARKET

Munich INDUSTRIEMAGAZIN in German Feb 84 pp 24, 26, 30, 31

[Interview with Ulrich Haier (Dr of Engineering), Siemens board member responsible for components, concerning the Munich concern's role in the worldwide IC [integrated circuit] business]

/Text/ INDUSTRIEMAGAZIN: For 8 months, an enormous boom has been prevailing on the international chip market with record orders, delivery waiting times, and hectic investment activity. Has this upswing also included the Federal Republic?

Haier: Yes, in the full width over the entire spectrum of components. Integrated circuits achieved expecially extreme growth rates here. Individual products have growths of 50 percent.

INDUSTRIEMAGAZIN: The American microprocessor manufacturer Intel recently stated that he is booked up for 1984 and can make no more deliveries. How do things look at Siemens?

Haier: Our delivery dates extend over several months, sometimes as much as half a year - even with products which previously we could deliver in a relatively short time. But, with appropriate capacities, we could surely make 30 percent more sales.

INDUSTRIEMAGAZIN: At the present time, where are the greatest bottlenecks?

Haier: Standard products which can be produced by several manufacturers in the world in a fully comparable fashion, these have the strongest demand. Certain dynamic memories or standard microprocessors such as the Intel family are desired worldwide. On the other side, complex components, for example "computer on a chip" are also doing extremely well.

INDUSTRIEMAGAZIN: Users complain that the manufacturers are exploiting this bottleneck situation in terms of price and are rejecting certain customers.

Haier: In contrast to some others, we are not exploiting the present possibilities with the buyer. We lay more stress on long-term good relations with the customer. Naturally, we give priority to our old, good customers.

INDUSTRIEMAGAZIN: What measures is management taking to overcome the bottlenecks?

Haier: First of all, we are pursuing chip or wafer production fully. When possible, we work around the clock. In our Austrian Villach plant we work four shifts, in Munich sometimes three. Even in assembly and testing we try to overcome the bottlenecks.

INDUSTRIEMAGAZIN: Are you also speeding up new technologies, for example the use of silicon wafers with larger diameters? Today, 5-inch wafers are considered standard, on which several hundred ICs can be produced at the same time. With larger wafers, you could increase the rejects without any problem.

Haier: We are working under high pressure on the technology for larger wafers, for example with a 6-inch diameter. But it is not at all so simple to obtain the appropriate equipment, such as optical devices. The manufacturers are generally American and they too have delivery delays.

Product and technology development operate in the medium to long term. Much time elapses until products are accepted and really mature for the customer. But as far back as last May we prepared for the coming development and we decided to employ 150 engineers additionally for design, that is design of new products.

INDUSTRIEMAGAZIN: Everywhere in the world new chip factories are now going up. Many manufacturers will be able to start up their production sites only by 1985, when the boom perhaps is already passe. How do you control your investments in such a turbulent market?

Haier: In previous years, we tried to bring steadiness into investments. On the basis of our positive estimate of the growth trend in information technology, we have expanded certain capacities. In Villach, in September of last year, the foundation stone was laid for a second large production lane.

INDUSTRIEMAGAZIN: For the 256 K bit memory chip?

Haier: Generally for structures up to 1.5 µm. Naturally, we can also produce 256 K here. This will become our draft horse with which we will start up our lines.

INDUSTRIEMAGAZIN: Sir, you are set up for mass production with 256 K?

Haier: Yes, naturally. But we are also promoting the sale of special circuits with smaller numbers of units. Already at the beginning of 1983, we built a production lane for 2.5 µm structures in Munich, that is structures that are not quite so fine. Here we produce semi-customer-circuits in C-MOS, and imported key technology. What I want to say is: We do not set up a production lane for a particular memory, for example 64 K, but for a particular capacity and particular technologies, which we then use optimally for the market. Memories are then used

as start-up products to optimize yields. As soon as the line is stabilized and as soon as we control all the process data, we follow up with complex logic production, which is more favorable from the point of view of the competitive situation and price.

INDUSTRIEMAGAZIN: What does a new chip factory cost?

Haier: For a modern top line for 5-inch wafer production with structures of 1.5 µm, you have to put a good 200 million marks, including the buildings.

INDUSTRIEMAGAZIN: But you never recoup your investment, in view of the mad technological progress.

Haier: With such an installation, we are counting on a lifetime of about 7 years. Here, units would have to be replaced within a line, or other functions will have to be integrated. For such an investment to be profitable, one has to reach a high yield rapidly, one must have a good load factor, and one must have a good product spectrum. This is then a marketing and design problem. It all depends on the market constellation, on the branches that one works on, on the partners with whom one works. Surely, the American and Japanese manufacturers have a more favorable growth substrate than the Europeans, on account of their broader and more homogeneous market.

INDUSTRIEMAGAZIN: Japanes and American semiconductor companies divide the world market between them. The Europeans internationally rank as "also rans."

Haier: From the point of view of volume, Americans occupy the first rank, especially as regards logid products. The Japanese have really caught up extraordinarily with the standards. Altogether, 60 percent of the semiconductor market falls to the Americans and about 30 percent to the Japanese. Western Europe is thus represented relatively weakly.

INDUSTRIEMAGAZIN: Wherein lie the strengths of the Americans and Japanes, and where lie the weaknesses of the Europeans?

Haier: The Americans are good in technology, funded and supported by powerful businesses. They are outstanding in design and in the use of computer aids for design. The Japanese have purchased a great deal of technology and have very early on worked themselves up from simple design and simple products. Here, the memory chips were the technological draft horse by means of which they successfully plowed the market. And they pursue the long-term market objective consistently and undeterred. This is decisive.

INDUSTRIEMAGAZIN: And Europe? The old continent covers only 30 percent of its chip demand from its own sources.

Haier: For many reasons we Europeans are late starters. One reason is that, until 1975, we had overemployment, and our economy was not under any pressure to innovate. Another factor is that we are lacking a large domestic market.

But technologically we have caught up, at least at Siemens. But you are quite right, a European dependency in this area would be dangerous in the long run. This I have to state clearly.

INDUSTRIEMAGAZIN: What role does Siemens play in the international semiconductor business?

Haier: Our production goes one-fourth into our own enterprises, a good third of it goes into the German market, and the rest into the remainder of the world. Europe dominates here; non-European deliveries make up approximately 10 to 15 percent.

In the Federal Republic, we are the largest supplier, with a market fraction of over 25 percent. In western Europe, Philips is somewhat stronger.

INDUSTRIEMAGAZIN: In what IC segments do you feel particularly strong?

Haier: We have a strong pillar with standard processors. With our custom-specific chips we have strengths wherever we collaborate with appropriate leading customers, for example in our business area of communications technology. The Siemens telex, equipped with our own ICs, was a real hit. Today, digital technology is the usual system technology in telephone transmission. And we play a role here too. We also have established close relations with the automobile industry. And finally we also do a good business with entertainment electronics, for example with Grundig.

INDUSTRIEMAGAZIN: How long will this last? Your competitor Philips soon will have the say-so.

Haier: I don't know if anything will change here. For example, Grundig uses the standard processor 8051 to control its color TV. This processor comes from the Intel family, and we are one of the few manufacturers in the world that fabricate successfully, so that the partnership is not one-sided but depends on our performance capability.

INDUSTRIEMAGAZIN: Up to now, Siemens plays a leading role only on the German market. Strategically, where do you want to go; do you want to expand your in-house fraction even more strongly?

Haier: Only within certain limits. Our problem as regards in-house demand is the breadth of the overall spectrum which extends from installation engineering through medicine, automatic, and power plant engineering up to data and communications technology. It would be economically hopeless to try to cover everything, and in this way we could never get beyond the minors. For this reason, we must here concentrate on our strategically most significant systems and devices. Altogether, we will play a more important role on the world market.

INDUSTRIEMAGAZIN: You're really tackling something here. Many lucrative markets are essentially occupied. Data technology is being skimmed by the

Americans, and entertainment electronics by the Japanese. Even in Europe, the chip suppliers Philips and Thomson-Brandt divide up entertainment electronics essentially among themselves. How do you intend to improve your position here?

Haier: First of all: both in data technology and entertainment electronics we really have something to say. We have the fastest ECL-gate arrays for computers and supply top-of-the-line products for entertainment electronics. We have a definite presence in these markets. One of the cornerposts of our strategy is technological independence. Starting from our excellent research, we have achieved such independence. We are capable of making our ICs with our own technical knowledge. Here I would like to mention with praise our good collaboration with other manufacturers, with institutes and with the BMFT [Federal Ministry for Research and Technology]. We are also strong in chip design, with full use of CAD. Without CAD you can no longer produce a complex chip. The fact that at the present time we are developing and manufacturing an important supplementary module, the so-called ADMA [Automatic Drafting Machine], for the most recent Intel central processor, proves our know-how.

INDUSTRIEMAGAZIN: Could you imagine that Siemens Company will produce a standard series like the Intel 8088?

Haier: With present market conditions it would be misguided to offer such standard series. We see our opportunities more in collaboration with certain branches and customers. Vendors and buyers are growing ever more strongly together. The component manufacturer is involved in the functional design of the devices, the device manufacturer puts know-how, properties, and specifications into the chip. For this reason, we must open the door to the device manufacturer and we must give our customers the opportunity of working with our design rules. This too is where the application possibilities lie for our semi-customer-switching circuits.

INDUSTRIEMAGAZIN: With this strategy, how do you reach the necessary volume?

Haier: Industrial development progresses; the market widens. Precisely with semi-customs, the semi-customer specific integrated switching circuits, this allows altogether smaller and nevertheless economic numbers of units. The art lies in penetrating into certain segments with a certain bandwidth, with synergy effects. In connection with digital picture processing, we currently think mostly about television and video, and entertainment electronics. This digital picture processing, however, is extensively growing also in connection with professional users, for example in medical engineering or in measurement and control engineering, work-station computers of various originas. For us, an understanding of the application is decisive, good collaboration with the device manufacturers. This is the opportunity for the old Europe.

INDUSTRIEMAGAZIN: Once again, does this pay?

Haier: We must live with multiplicity, but on the other hand we cannot and do not want to do everything alone. This imposes severe requirements on the manner in which one builds up one's production lines, conceives one's design, and optimizes costs.

INDUSTRIEMAGAZIN: You mentioned before that the world is your market. Would it not be logical then to be represented in the USA or in Japan with your own chip production? For strategic reasons, users do not like to purchase their components from overseas. Furthermore, precisely the manufacture of custom-specific chips requires proximity to the device manufacturer, a local presence.

Haier: This is an important question. In the United States we have a marketing branch for ICs and some production facilities in very special areas, for example in opto-electronics.

INDUSTRIEMAGAZIN: Are you planning a chip-production facility in the United States?

Haier: This question is still open. In Japan, in any case, we are not building our own production lines. The market is too complex, and there we could also enter only through a joint venture.

INDUSTRIEMAGAZIN: Couldn't you make more of your minority interest in the U.S. chip manufacturer Advanced Micro Devices (AMD)?

Haier: We maintain a good partnership with AMD in the sense of technical-economic cooperation. An exchange of ideas is very valuable. A close coupling in the market does not exist, however. At this time there is no intention of changing this relationship.

INDUSTRIEMAGAZIN: Dr Haier, would you run the IC business at all if it were not so important internally within your company?

Haier: Today there scarcely exists any pure IC manufacturers, apart from Intel or AMD. The integrated circuit is so closely coupled with the device sector that solid relations with the chip manufacturer are indispensible for the device manufacturer, and vice versa. But, even regarded just by itself, it is such an important market segment of the future that Siemens cannot and will not pass it up.

But things cannot go on without the collaboration with other IC vendors. In view of the ever-increasing research and development expenditures for certain projects, partnerships - for example between Siemens and Philips - indicate the necessity of cooperation. In other words: without a conception for collaboration with component and device manufacturers, I would keep my hands out of IC production.

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STUDY COMPARES R&D EXPENDITURES IN FRANCE, U.S.

Paris ZERO UN INFORMATIQUE HEBDO in French 26 Mar 84 p 45

> [Text] How does European computer research compare with university laboratories or American manufacturers? The balance of power has just been calculated by the French Telecommunications and Electronics Council, an agency to promote technological cooperation set up following Abel Farnoux's electronics mission. In 1983, R&D expenditures for electronics in industry can be estimated at $23 billion in the United States, or 2.3 times more than in Europe as a whole and 11 times more than in France....

"The real solution," according to Abel Farnoux, "is through European cooperation and standards for certain sectors, however skeptical many European industrialists may be, since it is a fact that too much needs to be done for any country to be able to handle it alone."

"It is also a fact that, without a European base, intercontinental cooperative arrangements will be ineffective, as they will be completely out of balance."

In support of this appeal for European cooperation, the FTEC* has just published a second report: "Electronics Research and Development, United States and France 1982-83."

This study, conducted in the United States and Europe by Robin, Fourastier and Berthier, covers four sectors: home electronics; data processing/automated office systems, communications, and components (active and passive).

It estimates R&D financing in these areas in 1982 as follows:

--$18.5 billion in the United States (i.e., about 130 billion francs);

--12.5 billion francs in France, or about 11 times less.

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*French Telecommunications and Electronics Council, 42 rue des Jeuneurs, 75002 Paris. Tel: (1) 233-5125.

A breakdown by sources of financing would be more or less the same in France and in the United States.

--Financing from businesses' proprietary capital: 56 percent in the United States, 60 percent in France;

--Financing from public monies: 44 percent in the United States and 39 percent in France;

--Universities' share in the financing is less than 1 percent.

Major Differences

One should also note the heavy concentration of private financing in the United States. Only about 40 firms actually spend 70 to 75 percent of the total business expenditures out of their stockholders' equity.

The first one, IBM, spent $2 billion on R&D in 1982 (2.5 billion, if research on contract is included), or about twice as much as total R&D expenditures by French industry ($1.1 billion in equity capital and $1.5 billion including research on contract).

If research conducted in public laboratories is counted, the total for 1982 is as follows:

--$18.5 billion in the United States, or 16 percent of the final value of goods produced;

--$1.8 billion (12.5 billion francs) in France, or 15 percent of the final value of the goods produced.

By sectors, and using the 1982 base of 1 dollar = 7 francs, the ratio of France to the United States is as follows:

--data processing: 1 to 13;

--household electronics: 1 to 10;

--communications: 1 to 8;

--components: 1 to 14.

R&D in Electronics: United States

	(1) États-Unis (en milliards de dollars)				
	(2) Informatique	(3) Électronique grand public	(4) Communications	(5) Composants	Total
dustrie fonds (6) opres	4,6 (77 %)	0,3 (100 %)	3,8 (51 %)	1,6 (62 %)	10,3 (63 %)
dustrie fonds (7) ublics	1,2 (20 %)	—	3,5 (48 %)	0,8 (31 %)	5,6 (33 %)
niversités (8)	0,2 (3 %)	—	0,1 (1 %)	0,2 (7 %)	0,6 (4 %)
otal	6 (100 %)	0,3 (100 %)	7,5 (100 %)	2,6 (100 %)	16,5 (100 %)
tra-muros public (9)	0,5	—	1	0,5	2
and total	6,5	0,3	8,5	3,1	18,5
leur de la oduction (10)	49,3	8,2	45,5	17	120
&D Industrie/ oduction (%) (11)	12 %	4 %	16 %	14 %	13 %

R&D in Electronics: France

	(12) France (en milliards de dollars)				
	(2) Informatique	(3) Électronique grand public	(4) Communications	(5) Composants	Total
lustrie fonds (6) opres	0,33 (74 %)	0,03 (100 %)	0,61 (69 %)	0,10 (50 %)	1,07 (69 %)
lustrie fonds (7) blics	0,09 (19 %)	—	0,27 (31 %)	0,09 (43 %)	0,45 (28 %)
iversités (8)	0,03 (7 %)	—	–	0,01 (6 %)	0,04 (3 %)
tal	0,45 (100 %)	0,03 (100 %)	0,88 (100 %)	0,2 (100 %)	1,54 (100 %)
ra-muros public (9)	0,04	—	0,16	0,03	0,23
nd total	0,49	0,03	1,04	0,23	1,79
eur de la duction (10)	3,71	0,94	5,43	1,89	12,0
D Industrie/ duction (%) (11)	11 %	3 %	16 %	10 %	13 %

[Key on following page]

Key:

1. United States (in billions of dollars)
2. Data Processing
3. Home Electronics
4. Communications
5. Components
6. Industry-equity capital
7. Industry-public monies
8. Universities
9. Government research
10. Value of production
11. R&D Industry/Production (%)
12. France (in billions of dollars)

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FRG INVESTS DM 60 MILLION TO FOUND RESEARCH NETWORK

Munich COMPUTERWOCHE in German 6 Apr 84 p 6

> /Text/ St. Augustin/Bonn (bi) - Before a high-caliber group of participants from research, industry and politics, the Federal Research Minister Heinz Riesenhuber now celebrated the foundation of the association to promote a German research network (DFN) Twenty-one members from major research, universities, and industry joined the DFN Association on 12 January 1984. Its objective first of all is the formation of an open association system of college and other research centers, via Datex-P. Included are DEC, IBM, Nixdorf, Philips (PKI), and Siemens.

Riesenhuber said that this "association of associates should go together into a single integrated working community." But the project will be successful only when the collaboration of the government has become superfluous. During the start-up dates, the Federal Ministry for Research and Development (BMFT) will invest 60 million marks for the participating public institutions, such as for example the Fraunhofer Society, the Hahn-Meitner Institute, the Max-Planck Society, etc.

The DFN Association pursues several intentions in building up its research network, essentially intentions involving competitive policy, sciency and finances. In terms of competitive policy, the creation of facts and of actually practiced examples should influence the standardization of the higher levels of the ISO reference model, 4 through 7. However, as regards already specified standards, the intention is to adhere strictly to ISO and CCITT and to work closely together with these committees. On the one hand, in the words of Minister Riesenhuber, the association should be a mouthpiece to represent the European partner countries with respect to their "national position"; on the other hand, however, there is certainly no wish "to nationalize science". Hopefully, the BMFT also designates the ambitious project as "the beginning of a European association, but an association which should not become "a closed club".

The founders of the association are promising themselves profound improvements for the entire scientific sector. The linkage of computer and data base services could create the "critical mass" which finally could convert the much-lamented lage of the Federal Republic in technological development into a top position.

Especially addressed here were the areas of VLSI design, CAD/CAM/CAE, high-energy and plasma physics, robomation, pattern recognition, and the joint use of distributed data bases.

The initiators see the financial advantage primarily precisely in the joint use of national and international computer and DB resources for their "applied research" and for product development.

The German Research Network wants to use appropriate software developments to offer the following services:

random and unhindered access to the dialogue units installed in participating institutions, involving all data processing services in the entire network (dialogue linkage);

transmission of data inventories between participating institutions (data linkage);

use of distributed resources by computer-computer communication (program linkage);

exchange of texts and communications between the participating institutions (communication linkage).

A Side Swipe

Within the framework of the celebration to found the DFN Association, Professor Dr Karl Zander from the Hahn-Meitner Institute, Berlin, and member of the board of the new association, stressed to Minister Riesenhuber that he should represent to his ministerial colleague Christian Schwarz-Schilling the necessity of reasonable fees. The BMFT surprisingly responded in detail to this "chaste directive". The centerpiece of his position as regards the open question of fees: "The come-on drug must be cheap!"

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SCIENTIFIC AND INDUSTRIAL POLICY

FRANCE'S THOMSON TAKES STEPS TO IMPROVE FINANCIAL SITUATION

New Kind of Stock

Paris ELECTRONIQUE ACTUALITES in French 11 May 84 p 20

[Unsigned article]

[Text] As a result of the losses accumulated since 1981, Thomson-CSF's capital has been entirely exhausted, and the company's stockholders' equity has become negative.

The solutions selected to end this untenable situation were presented to the press by the enterprise's president, Alain Gomez, and by its financial director, Christian Aubin.

Thomson-CSF's stockholders' equity will be rebuilt in June according to a complicated maneuver involving two simultaneous and combined operations.

Two Combined Operations

The simpler of the two consists of having the nationalized parent company, Thomson SA (formerly Thomson-Brandt), bring in 1.2 billion francs of fresh money. But these funds will be injected through rather convoluted means. A Thomson SA subsidiary will buy, not CSF shares, but convertible bonds. These will be exchanged for shares at year's end, thus enabling Thomson-CSF's stockholders' equity to go from a negative figure of 550 million to 650 million.

The stock created in December will be divided into two essentially equal parts. The first will be retained permanently in the Thomson group, and the second will remain in the subsidiary that subscribed to them, where they will be kept safe and sound until the private sector ultimately buys them. Consequently, the division of Thomson-CSF's present capital between the nationalized company which has slightly over 50 percent of it, and private shareholders, will be maintained.

How will private stockholders become interested in these shares? That is where the second simultaneous operation comes in. It will be what the Anglo-Saxons call warrants, and which in this case will be called a bond with the right to stock acquisition. The investor subscribes to a conventional obligation, but this time associated with the right to acquire a share of the company within a certain time period at a predetermined price.

The terms and conditions for all these operations will be established on 23 May. It is likely that the price at which the shares will be available will be slightly higher than the Bourse quotation (which is over 300), and could settle around 350 F. The period during which the stock will remain available to the public should be three to four years. It is in fact possible that the price will be raised each year to encourage the public to reclaim shares as rapidly as possible so as to pay less for them than in the future, and to preclude the need for Thomson SA to carry these titles during the longest expected period.

Attraction of Warrants

The philosophy behind these warrants needs to be explained. The mechanism is very attractive for a company, which like Thomson-CSF, passes through a difficult phase in which the issue of conventional stock would be a delicate matter. It allows the company to issue obligations at a rate below market--a counterpart to the additional advantage represented by the warrants--thus lightening the weight of the bond. If the warrants are used in the coming years, the company further benefits from a reinforcement of its stockholders' equity by a sort of deferred stock issue.

For the subscribers, the warrants offer many attractions. The possibility they offer to subscribe to shares at a price slightly higher than that of the Bourse but for a rather long period, allows them to plan for the future while avoiding the need to trade from a delicate position. If in the years to come, the business recovers and sees its stock prices rise, the right to obtain stock at a price which then will be far lower than the market will give the subscribers a very elegant profit.

Even without waiting for this outcome, warrants can be negotiated on the Bourse, where it is quoted. This type of title is highly speculative: its value would in fact drop to zero as soon as the market value of the stock would never be able to reach the price fixed for acquiring the shares; but at the same time, it could be multiplied several-fold when the market price increases. Assume that the price fixed for Thomson-CSF is 350 F, and that on the Bourse, the shares climb to 500 in the next year or two. Given the original value of a warrant, which is 10 or 20 francs, the gain in value can be considerable, since in theory, under our hypothesis, the warrant would be worth 150 F.

Chances for Return to Profits

For the warrant to prove itself a good investment, Thomson-CSF must obviously improve its situation. What are its chances for success? For 1983, the deficit of the company alone was reduced from 1993 million to 892 million francs. It would be somewhat lower if consolidated. Of these amounts, the losses considered as exceptional have reached 318 million against 793 million in 1982. These are essentially stock depreciations intended to bring accounts in conformity with international rules.

Belying the hopes of some supporters of CSF shares on the Bourse, Alain Gomez declared that 1984 will again show a deficit, with the extent of the loss expected to be reduced in the same ratio as that of last year. What is important, is that 1984 must be the year for reversing the trend, with a return to profits during the year but too late to change the overall results. On the other hand, 1985 will be completely positive, and the goal for 1986 is for all Thomson-CSF activities to be at least balanced.

An elementary financial analysis shows the happy consequences of this objective. The company refuses to provide details of its results by activities, but it is known that the equipment and systems branch, oriented toward the military, is certainly profitable and has good prospects with its many orders, including the recent large contract with Saudi Arabia.

All of last year's losses came from components, medical imaging (several hundred million each), and public telephones. The latter, following agreements with CGE, will account for only 40 percent of its losses in CSF's accounts. With the present structure of the company, the 1983 deficit would actually have been only 566 million. It is therefore not unreasonable to think that in 1985-1986, Thomson-CSF could show a profit of the order of one billion francs. This is the type of reasoning which justifies the rise in the company's stocks from 134 at its lowest in 1983, to 345 recently.

The Situation of Thomson SA

The parent company, Thomson SA, has a less delicate financial situation. It retains a stockholders' equity of more than 2 billion, after a consolidated loss estimated at 1.2 or 1.3 billion for 1983. Its financial resources were reinforced by a 1 billion francs capital endowment from the state, which was used to finance most of the 1.2 billion francs injected into CSF. Moreover, the company will launch a conventional loan of 1.5 billion on the bond market. Although the results of the consumer sector deteriorated in 1983, the company's own activities have no sources of large losses. The return of the CSF subsidiary to profits would also place Thomson SA's accounts on a clearer path.

Results by Branch

Paris L'USINE NOUVELLE in French 10 May 84 p 41

[Article by Claude Amalric]

[Text] The recovery? Alain Gomez believes in it. At the end of this year. The overall results support it. But losses remain high.

After 2.2 billion francs of losses in 1982, everyone was lying in wait for Thomson--and for its president, Alain Gomez--in 1983. Neither gain nor loss: last year's result is a loss of 1.2 to 1.3 billion francs, for revenues of 56.3 billion. The hole is therefore half filled, in accordance with estimates, allowing Mr Gomez to hazard a prediction: "We expect to come out of the red toward the end of 1984."

In order to win its bet--profitability in 1985--Thomson cannot remain satisfied with the billion received from the government, 750 million francs of which went to components.

That is why 1.5 billion francs of conventional bonds will be issued starting this month, complemented by 1.2 billion of convertible bonds transferred to a subsidiary created for the purpose, plus 850 million francs of obligations of a special nature.

Despite the general recovery, the four strategic branches of the group still have to be watched.

That is notably the case of electronic components, and especially of integrated circuits. It remains fixed for the next one or two years. With a turnover of 3862 million francs, the branch was increased in 1983 with the Eurotechnique plant in Rousset (500 employees, 120 million francs of revenues) and with Semi-Conducteur Alcatel (SCA). As for the recently announced integrated circuit assembly plant of Lorraine, "it is the result of a purely economic choice, which takes into consideration the facilities given to the region, and not of pressure from the government." Hence the action.

The case of the medical branch is less clear. Composed of the various departments of CGR, it has achieved a turnover of 3.6 billion francs in 1983. This year, it is expected to do 3-4 percent better: stagnation. Orders, which had dropped by 20 percent last year, should resume in 1984. They are hoping for 10 percent better, but they would need more to absorb the losses of 643 million francs recorded in 1983. Reductions in personnel (-5 percent in 1984) and investments (+43 percent) remain the only available remedy.

After a loss of 100 million in 1983, consumer goods are picking up slowly according to an estimate of a 13-14 percent improvement in revenues (19.3 billion) and exportations (11.6 billion) this year. Employment however, is still decreasing (-6 percent of 37,500 employees), while investments stagnate at +4 percent. A great deal of hope is being placed in the MO-5 computer line.

Engineering is another sector to be watched. With a loss of 200 million francs with revenues of 1.9 billion, Sodeteg (2700 employees) is paying heavily for a badly negotiated South American contract. Overall, the branch is not progressing, with 7.5 billion in revenues. Exportation will improve in 1984 by 30 percent of last year's 3 billion. But the danger lies in orders, which seem to continue to drop.

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MAJOR FRENCH SCIENTIFIC GROUPS TO BORROW FUNDS FOR RESEARCH

Paris AFP SCIENCES in French 17 May 84 p 4

[Text] Paris--The AEC (Atomic Energy Commission) and the CNES (National Center for Space Studies) will be authorized by the government to borrow 250 million francs from banks for reallocation to public research agencies, it was learned from a reliable source on 17 May.

The amount of this borrowing is about half of the reductions in disbursement appropriations (418 million francs) announced at the end of March, according to the government's decision.

The AEC's and the CNES' respective shares of this amount will be 140 and 110 million francs.

The loans will be distributed among selected agencies as follows:

--110 million for the CNRS (National Center for Scientific Research);

--30 million for the CNEXO (National Center for Exploitation of the Oceans);

--23 million for INSERM (National Institute of Health and Medical Research);

--30 million for the INRA (National Institute for Agronomic Research); and

--7 million for the INRIA (National Institute of Data Processing and Automation Research).

In addition, the AEC will keep 30 million francs for its own use, and the CNES will keep 20 million.

Strong protests were voiced at the announcement of the reductions in appropriations which, for program authorizations, amounted to 1.23 million francs.

The Advanced Research and Technology Council (CSRT), an advisory agency of the Ministry of Research, sent a formal notice to the Minister of Industry and Research indicating its "serious disagreement" with the decision.

After a "cry of alarm" issued by 15 well-known researchers on 9 May against the austerity policy in the field of research, two unions of research workers, the SNCS (National Union of Scientific Researchers) and the SNTRS-CGT (National Union of Scientific Research Workers) also made strong protests. The text of their statements can be found elsewhere.

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FRENCH-NORWEGIAN RESEARCH FOUNDATION FORMED

Paris AFP SCIENCES in French 17 May 84 p 3

[Text] Paris--A Franco-Norwegian Foundation for Scientific and Technical Research was established in Oslo on 26 April 1984, as part of an intergovernmental agreement of cooperation between the two countries.

The purpose of this foundation is to promote contacts and exchanges between research institutes, educational institutions, enterprises and individuals. It will raise funds to implement joint activities and specific cooperative projects in priority fields.

This cooperation could take the form of fellowships for exchange students or research workers, joint workshops or seminars, research and development projects between research institutes and industrial firms, or, finally, publications of mutual interest.

The foundation is headed by a board of directors equally divided between the two countries. For this first year, Johan B. Holte, Director of Norsk Hydro, will be chairman and Jean-Claude Balaceanu, Director-General of the French Petroleum Institute will serve as vice-chairman.

The Board also has three Norwegian members: Inge Johansen, president of Statoil; Trygve Gulliksen, director of Bjorge Enterprise; and Kjell Martin Fredriksen, section chief, Federation of Norwegian Industries.

The three French members are: Jean-Loup Motchane, director of scientific and technical cooperation at the General Directorate of Cultural, Scientific and Technical Relations, Ministry of Foreign Affairs; Daniel Bernard, a member of the International Affairs Office in the Ministry of Industry and Research; and Roger Chalvon Demersay, an advisor in the office of the president of Alsthom and president of the French-Norwegian Contact Committee at the CNPF [National Council of French Employers].

They are assisted in their work by Erik Normann, secretary of the board, and Mr Riviere, deputy secretary.

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TECHNOLOGICAL INNOVATION EFFORTS IN SWEDEN SHOWING RESULTS

Paris LE MONDE in French 17 May 84 p 16

[Article by Guy de Faramond]

[Text] For a long time the Swedes have lived on the reputation of their multinationals, which have grown up from inventions developed by Swedish engineers: Sven Wingquist in 1876 for ball bearings (SKF); Carl Munters and Baltzar von Platen in 1919 for absorption refrigerators (Electrolux); Gustaf De Laval for cream separators (Alfa Laval) and the steam turbine in 1883 (De Laval Angturbin AB); Alfred Nobel for dynamite (Nitro-Nobel); and closer to our time, Ruben Rausing for beverage packaging (Tetra Pak); Uno Lamm for very high voltage lines (Asea); and Bengt-Gunnar Magnusson for the AXE telecommunications system (Ericsson).

It took the first oil crisis in 1973-1974 and above all, the second crisis in 1979 for the Swedes, who had been more or less resting on their laurels, to react--particularly in technological innovation. In this area, efforts directed toward training and the encouragement of business creation are now beginning to produce results.

Every year five technological schools (Stockholm, Goteborg, Lund, Kinkoping, and Lulea) graduate 2,000 engineers. This amounts to 242 engineers per 1 million inhabitants. This compares with 214 in France, where there are actually 154 engineering schools. But research is done in only 55 of these schools, while in the five Swedish technological schools, the faculty members are also involved in research.

The Swedes invest almost as much money in research in their technological schools (299 million kronor, which is the same number of francs) as the French do in their 55 engineering schools (318 million francs). It is in these schools that a good many innovations are developed, as well as a significant number

of technology-based enterprises. University-industry relations have never been considered a problem, but rather a solution. Since the mid-1960s, Professor Torkel Wallmark of the Chalmers technology school at Goteborg has been a pioneer in this area.

During a colloquium sponsored in Strasbourg last fall by the ANCE [National Agency for the Creation of Business] and the AFSR [Franco-Swedish Association for Research], he explained: "In Sweden, engineers and industrialists know each other well. We lend money to build prototypes, and the STU [Office of Technical Development] supports projects. Nearly 60 percent of our final research reports are written in cooperation with industry. A certain number lead to the foundation of companies." And with a note of pride, Torkel Wallmark added: "We spend more time than MIT does in creating our enterprises, but we have fewer failures."

Between 1973 and 1983, 56 enterprises were created in the Chalmers "House of Innovation," which is a real breeding ground for innovation. At these enterpries, 500 jobs were created. This may seem a modest result, but these are solid jobs, which will generate other jobs and have a future.

Intense activity is also evident at Lund, alongside the technological school, where construction of a scientific park began in September 1983. Several hundred people will be working there in 1990. Here they will be stimulating innovation by maintaining close contact between engineers and industry, and this will also shorten the lead time between invention and marketing.

The areas selected are electronics, computers, and chemistry, to start with. A major communications system will link the labs and workshops. The amount of the investment is 500 million kronor, of which 150 will be used for the first segment of the work.

An excellent example of such a technology-based firm is located at Lund. This is the Gambro company, which was founded in 1961, basing its work on an innovation, a new dialysis device. Since that time the company has continued to diversify its products and to prosper in foreign markets. With 2,500 employees, 800 of whom are in Sweden, Gambro in 1982 had a total sales volume of 1 billion kronor and profits of 125 million kronor. "Our sales are growing by 25 to 30 percent every year, and profits are rising even faster," explains the young Gambro manager, Anders Althin. "We offered our stock for sale on the Stock

Exchange of Stockholm in April 1983 and on the New York Stock Exchange 2 months later. Our stock offering in Sweden in 1983 was the most sought after on the market. There was enough for only 5,000 buyers, and there were 100,000 bids to purchase. The price of the stock doubled overnight. Our strength lies in the fact that we are the only company in the world that supplies both to hospitals and to patients at home all the dialysis and kidney-related equipment they need."

Another innovation which has met with amazing success is the Micronic portable computer designed by Gerhard Westerberg. This pocket computer makes it possible for a store to do in 1 hour the painstaking work that used to take 6 to 8 hours spent filling out forms.

Each of these little marvels sells for 8,000 kronor. According to Gerhard Westerberg, it pays for itself in 4 months. Now that the product is well established in Europe (it is now appearing in the U.S. and Japanese markets), it no longer interests its inventor. So he sold Micronic and established Venture Electronics with a small staff of young people. "What I am interested in is creating new products. Our advantage comes from the fact that we are engineers, technicians, and sales representatives, all at the same time. There is no problem about money. The investors have confidence in us."

Holger Crafoord and Gerhard Westerberg are excellent examples of the new Swedish entrepreneurs, worthy successors of the great industrial leaders at the start of the century. In a rather laudatory report published by MIT* on the creation of innovation-based enterprises in Sweden, we find that in these enterprises, the sales volume per employee is 380,000 kronor per year, while it is only 280,000 kronor per year in the "old" manufacturing industries. That difference tells the story eloquently.

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* Report by James M. Utterback of MIT's CPA (Center for Policy Alternatives). "Technology and Industrial Innovation in Sweden. A Study of New Technology-Based Firms." 1982.

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13 July 1984